

**Western hemlock/salal-NWO Coast**

*Tsuga heterophylla*/*Gaultheria shallon*-NWO Coast

TSHE/GASH-NWO Coast

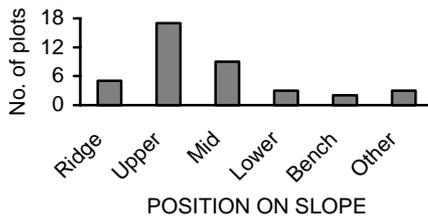
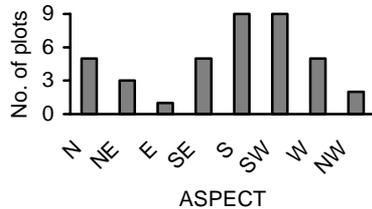
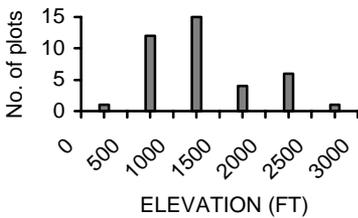
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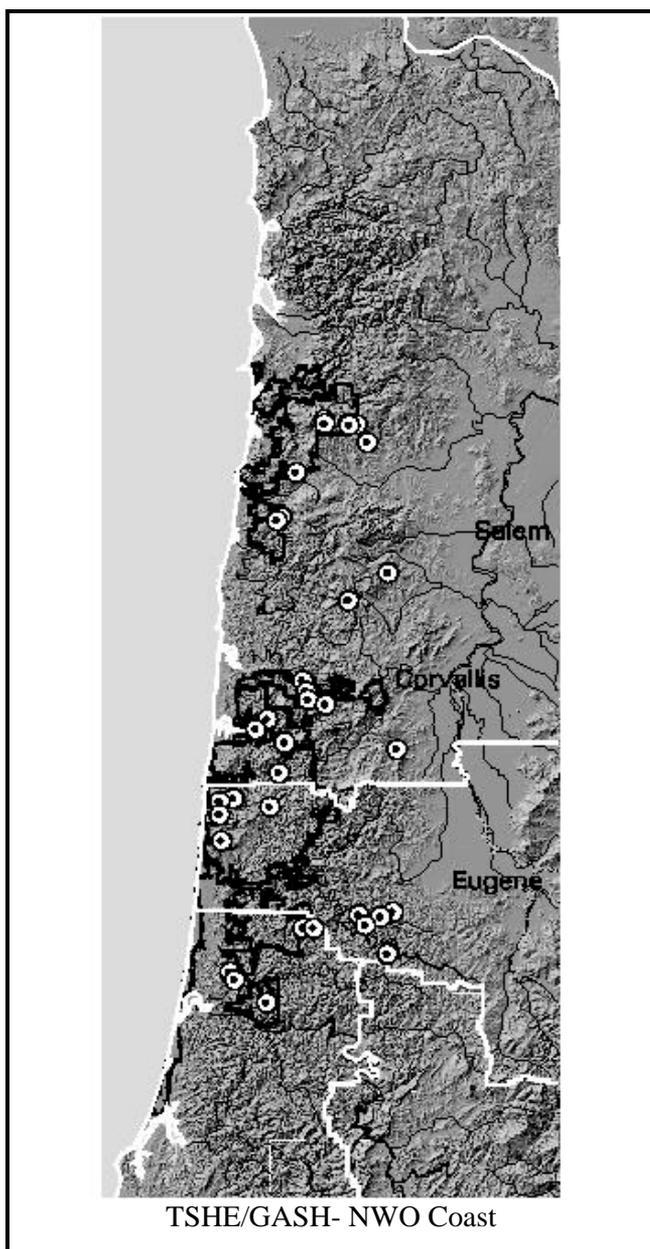
N=39 (SIU=29; EBLM=5; SBLM=5)

Environment and Distribution

This plant association occurs throughout the Coast Range. Plots are located on flat to steep slopes averaging 37% (range 0-90%), primarily on upper and mid-slopes or ridge positions. Aspects vary, but warm aspects are most common. Elevations average 1,319 feet (range 420-2,540 ft.).

Soils are moderately deep and well-drained.





## Vegetation Composition, Structure, and Diversity

The overstory in the TSHE/GASH-NWO Coast association is dominated by Douglas-fir, often with western hemlock and a minor component of western redcedar and red alder. Canopy closure of mature trees averages 72%. Cover of understory trees averages 4%.

This association has a well-developed shrub layer, with tall shrubs averaging 25% cover and low shrubs averaging 39% cover. The shrub layer is dominated by salal. Herb cover is dominated by sword fern and bracken fern and averages 21% cover, which is about half the mean for the series in the Coast Range. Low herb cover is typical of the drier associations. TSHE/GASH-NWO Coast and TSHE/MANE2-NWO Coast have the lowest average sword fern cover in the Coast Range western hemlock zone. Moss cover averages 24%.

Common name	Code	Constancy	Cover
<b>Overstory trees</b>			
Douglas-fir	PSME	97	65
Western hemlock	TSHE	57	25
Western redcedar	THPL	28	13
Red alder	ALRU2	24	3
<b>Understory trees</b>			
Western hemlock	TSHE	57	5
Douglas-fir	PSME	20	10
Cascara buckthorn	RHPU	20	3
<b>Shrubs</b>			
Salal	GASH	100	51
Red huckleberry	VAPA	93	10
Trailing blackberry	RUUR	61	2
Dwarf Oregon grape	MANE2	52	3
<b>Herbaceous</b>			
Sword fern	POMU	93	14
Bracken fern	PTAQ	67	8
Pacific trillium	TROV2	54	1
Sweet scented bedstraw	GATR3	54	1
Redwoods violet	WISE3	46	5

TSHE/GASH-NWO Coast stands average 107 years old (range 50 to 250 years). Stands are well stocked, with live basal area averaging 301 ft<sup>2</sup>/acre.

Plots average 17 vascular plant species, which is low for the western hemlock series and for forested series in western Oregon.

Management Implications

Douglas-fir grows relatively well with an average site index of 161. Trees may be short due to frequent wind damage.

Slash burning to reduce competition should not generally be necessary. In fact, due to soils and topographic location, the salal type is susceptible to significant nutrient losses from burning. Fire effects are generally moderate but sites with thin soils are sensitive to fire (Barnett 1984).

	Site Index PSME
Mean	161
SE	3
Range	100-212
Age	111
n	84

## Western hemlock/devil's club-NWO Coast

*Tsuga heterophylla*/*Oplopanax horridum*-NWO Coast

TSHE/OPHO-NWO Coast

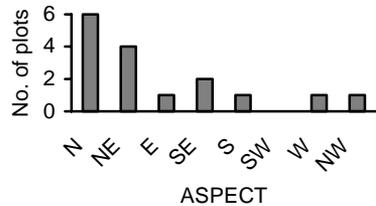
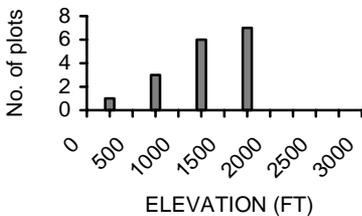
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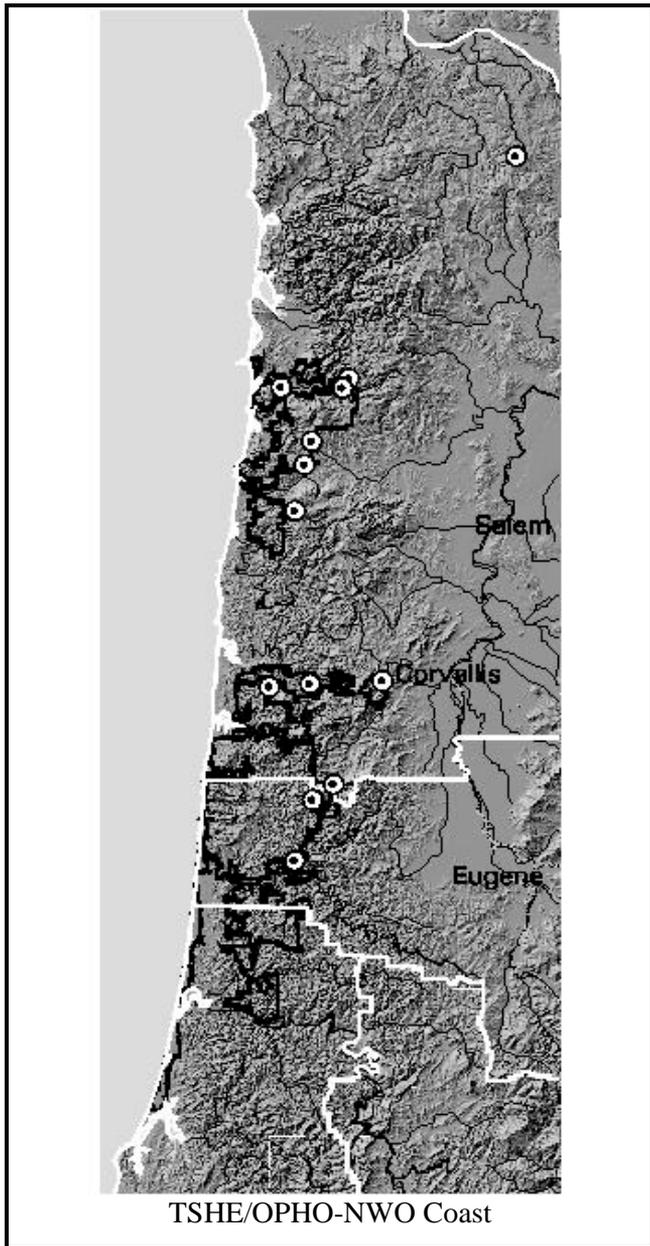
N=16 (SIU=13; SBLM=3)

### Environment and Distribution

This plant association occurs throughout the Coast Range on moist, productive sites. Plots are located on flat to steep slopes averaging 44% (range 3-88%) on lower to upper slope positions. Cool, northerly aspects are most common. Elevations average 1,355 feet (range 580-1,870 ft.).

Soils tend to be relatively shallow and moist, if not saturated, throughout the year. Soils depth average 40 inches with 22 inches of effective rooting depth.





## Vegetation Composition, Structure, and Diversity

The overstory in the TSHE/OPHO-NWO Coast association is dominated by Douglas-fir and western hemlock, very often with a component of red alder and/or western redcedar. Canopy closure of mature trees averages 74%. Cover of understory trees averages 2%. This association has a moderately developed tall shrub layer with tall shrubs averaging 46% cover, but low shrubs at only 3% cover. The shrub layer is dominated by devil's club, vine maple and salmonberry. Red huckleberry is always present. Herb cover is high, averaging 63%. The herb layer is dominated by Oregon oxalis and sword fern. Moss cover averages 22%.

Common name	Code	Constancy	Cover
<b>Overstory trees</b>			
Douglas-fir	PSME	100	47
Western hemlock	TSHE	81	33
Red alder	ALRU2	48	10
Western redcedar	THPL	33	15
<b>Understory trees</b>			
Western hemlock	TSHE	62	4
<b>Shrubs</b>			
Devil's club	OPHO	100	23
Red huckleberry	VAPA	100	7
Vine maple	ACCI	67	20
Salmonberry	RUSP	67	13
Salal	GASH	48	2
Dwarf Oregon grape	MANE2	43	4
<b>Herbaceous</b>			
Sword fern	POMU	100	51
Oregon oxalis	OXOR	95	28
Miner's lettuce	CLSI2	76	2
Deer fern	BLSP	76	3
Sweetscented bedstraw	GATR3	57	1
False lily of the valley	MADI2	71	1
Pacific trillium	TROV2	67	1
Mexican hedge-nettle	STME	48	2
<b>Grasses/Grasslikes</b>			
Columbia brome	BRVU	38	2

TSHE/OPHO-NWO Coast plots average 118 years old (range 85 to 250 years). Stands are poorly-stocked, with live basal area averaging 229 ft<sup>2</sup>/acre. Plots average 22 vascular plant species, which is about average for the western hemlock series in the Coast Range.

Management Implications

These sites tend to be productive with fertile soils. Douglas-fir grows well with an average site index of 182. Only in TSHE/RUSP and TSHE/RUSP-ACCI does Douglas-fir have a higher average site index.

	Site Index PSME	Site Index TSHE
<b>Mean</b>	181	158
<b>SE</b>	3	4
<b>Range</b>	145-229	130-188
<b>Age</b>	107	109
<b>n</b>	48	19

Many stands are relatively poorly stocked with conifers, probably due to intense competition during early succession. Where the type is extensive, species more tolerant of saturated soils, particularly western redcedar, should be considered for planting.

Alder and salmonberry will develop quickly on most sites after canopy removal. If salmonberry cover exceeds 10%, severe shrub competition can be expected following the opening of a stand. Vine maple and thimbleberry may be important competitors in some young stands.

Soils are moist all year long and pose special engineering problems. Soil compaction or erosion may be severe. Extensive heavy equipment travel should be avoided. In addition, these sites are often associated with water sources and there may be significant hydrologic impacts following disturbance.

## Western hemlock/Oregon oxalis-NWO Coast

*Tsuga heterophylla/Oxalis oregana-NWO Coast*

TSHE/OXOR-NWO Coast

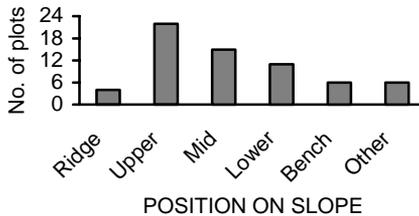
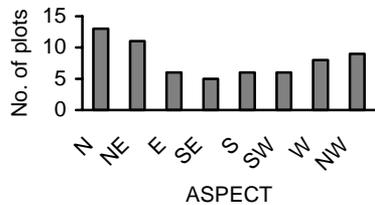
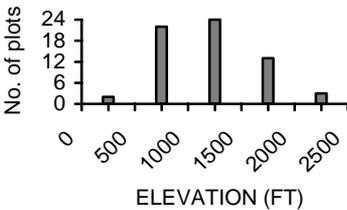
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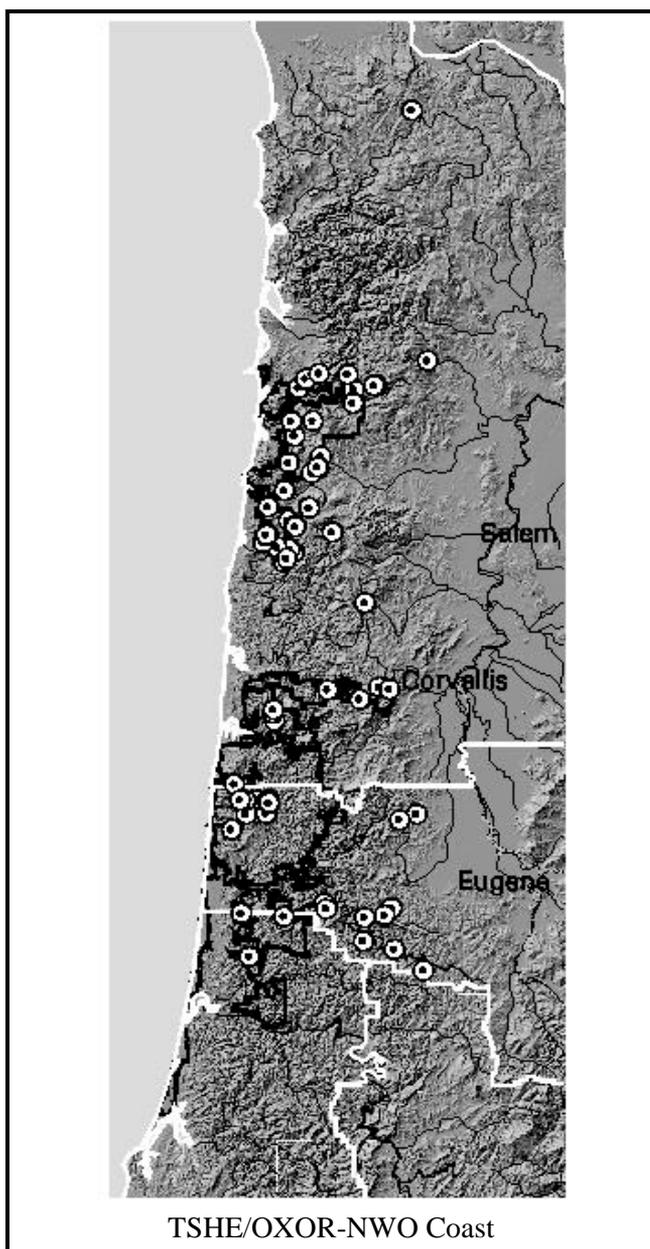
N=64 (SIU=44; EBLM=11; SBLM=9; ODF=1)

### Environment and Distribution

This plant association occurs throughout the Coast Range, on moist, shaded sites. Plots are located on flat to steep slopes averaging 44% (range 2-120%) on a variety of slope positions. Aspects vary, but cool northerly slopes are most common. Elevations average 1,177 feet (range 220-2,260 ft.). In lower precipitation zones near the Willamette Valley, this association occurs in moist microsites and lower slope positions.

Soils depth averages 50 inches with 37 inches of effective rooting depth.





## Vegetation Composition, Structure, and Diversity

The overstory in the TSHE/OXOR-NWO Coast association is dominated by Douglas-fir and western hemlock, often with western redcedar and a minor component of bigleaf maple and/or red alder. Canopy closure of mature trees averages 79%. Cover of understory trees averages 8%.

This association has a relatively sparse shrub layer with tall shrubs averaging 22% cover and low shrubs averaging only 4% cover. Minor cover from low shrubs is typical of moist plant associations in the Coast Range. Where vine maple is present it dominates the shrub layer. Red huckleberry is usually present and salmonberry and dwarf Oregon grape may be present.

Common name	Code	Constancy	Cover
<b>Overstory trees</b>			
Douglas-fir	PSME	95	44
Western hemlock	TSHE	84	36
Western redcedar	THPL	41	21
Bigleaf maple	ACMA3	25	28
Red alder	ALRU2	27	7
<b>Understory trees</b>			
Western hemlock	TSHE	65	10
<b>Shrubs</b>			
Red huckleberry	VAPA	91	4
Salmonberry	RUSP	56	3
Vine maple	ACCI	41	28
Dwarf Oregon grape	MANE2	37	3
<b>Herbaceous</b>			
Oregon oxalis	OXOR	100	35
Sword fern	POMU	100	46
Miner's lettuce	CLSI2	76	2
Pacific trillium	TROV2	72	1
Sweetscented bedstraw	GATR3	69	1
Deer fern	BLSP	60	1
Hooker fairybells	DIHO3	57	1
Ladyfern	ATFI	53	1

The lush herb cover is dominated by Oregon oxalis and sword fern and averages 68% cover. In addition to Oregon oxalis, small amounts of other moist site species such as Hooker's fairybell, miner's lettuce, ladyfern and deer fern are present. Moss cover averages 25%.

TSHE/OXOR-NWO Coast plots average 134 years old (range 52 to 310 years). Stands are relatively well stocked, with live basal area averaging 310 ft<sup>2</sup>/acre. Plots average 19 vascular plant species, typical for the western hemlock series in the Coast Range.

Management Implications

These sites tend to be productive, with fertile soils. Douglas-fir grows well with an average site index of 173.

	Site Index PSME	Site Index TSHE
<b>Mean</b>	173	153
<b>SE</b>	2	3
<b>Range</b>	128-214	75-203
<b>Age</b>	126	127
<b>n</b>	127	55

If salmonberry cover in a natural stand exceeds 10% cover, the shrub competition following a disturbance could be intense. Red alder often regenerates prolifically and grows exceptionally well once established. Oregon oxalis sites are generally resilient to fire effects (Barnett 1984).

Most Oregon oxalis communities are not immediately adjacent to streams, except in the rain-shadow of the Coast Range. Where the TSHE/OXOR-NWO Coast association does occur near streams, it can be an important component of riparian vegetation. Their most important contribution is usually woody debris. The parklike Oregon oxalis communities are visually appealing, especially in older stands.

## Western hemlock/Oregon oxalis-vanilla leaf

*Tsuga heterophylla*/*Oxalis oregana*-*Achlys triphylla*

TSHE/OXOR-ACTR

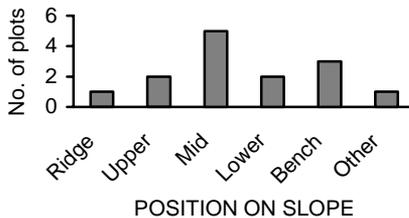
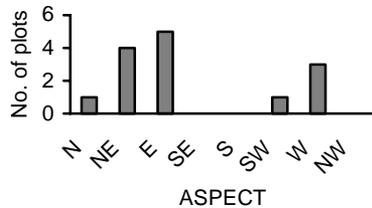
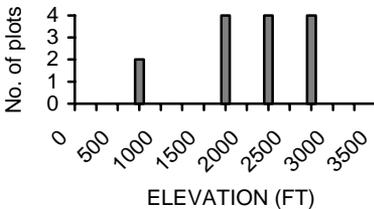
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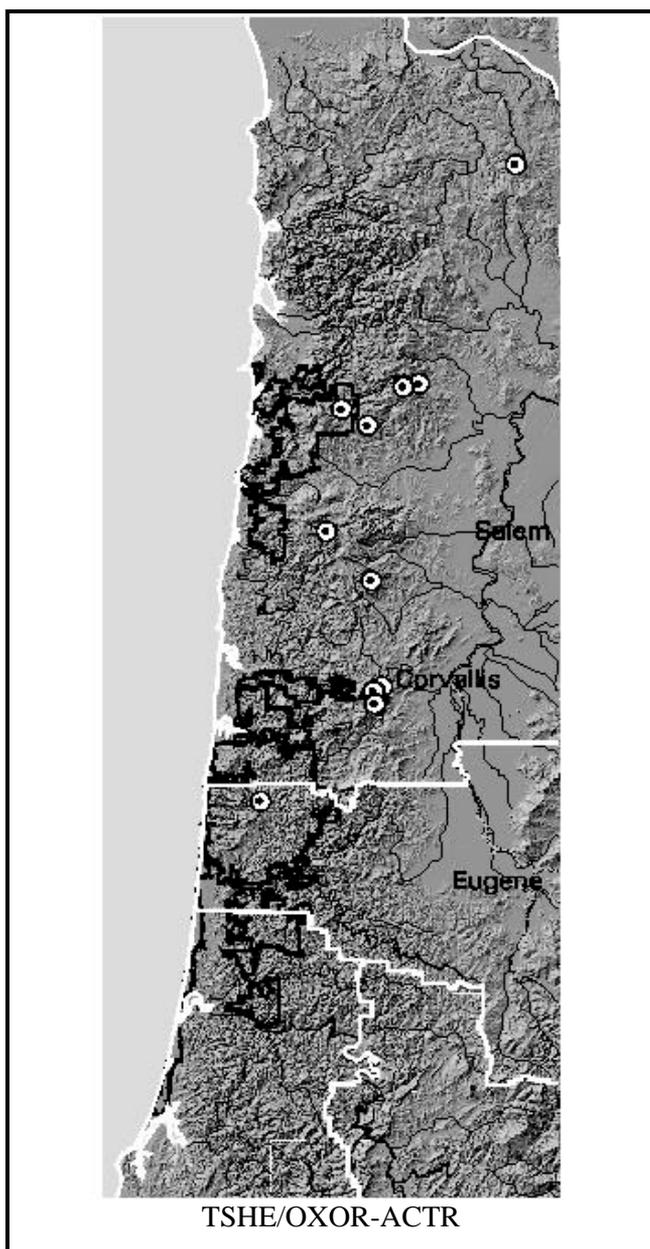
N=14 (SIU=6; SBLM=8)

### Environment and Distribution

This plant association occurs primarily in the northern and eastern portions of the Coast Range. Plots are located on flat to steep slopes averaging 26% (range 0-70%) on a variety of slope positions. This association occurs on cool aspects at relatively high elevations for the Coast Range. Elevations average 2,011 feet (range 950-2,740 ft.).

Soils are well-drained silt loam, gravelly silt loam, or clay loam.





## Vegetation Composition, Structure, and Diversity

The overstory in the TSHE/OXOR-ACTR association is dominated by Douglas-fir, often with large amounts of western hemlock, and a minor component of western redcedar. Canopy closure of mature trees on sample plots averages 77%. Cover of understory trees averages 9%. This association has a relatively sparse shrub layer with tall shrubs averaging 20% cover and low shrubs averaging 12% cover. The shrub layer is dominated by vine maple, usually with small amounts of red huckleberry, dwarf Oregon grape, and/or salal present.

Common name	Code	Constancy	Cover
<b>Overstory trees</b>			
Douglas-fir	PSME	100	55
Western hemlock	TSHE	53	48
Western redcedar	THPL	20	22
<b>Understory trees</b>			
Western hemlock	TSHE	93	8
Douglas-fir	PSME	20	4
<b>Shrubs</b>			
Red huckleberry	VAPA	87	5
Vine maple	ACCI	80	23
Dwarf Oregon grape	MANE2	73	8
Salal	GASH	73	9
Baldhip rose	ROGY	60	2
Trailing blackberry	RUUR	77	1
<b>Herbaceous</b>			
Vanilla leaf	ACTR	100	10
Oregon oxalis	OXOR	100	47
Sword fern	POMU	100	29
Sweetscented bedstraw	GATR3	80	1
Sweet-cicely	OSCH	60	1
Bracken fern	PTAQ	60	6
Starry false solomon's seal	MAST4	60	2
Ladyfern	ATFI	53	1
Hooker fairybells	DIHO3	53	1
Pacific trillium	TROV2	60	1
False lily of the valley	MADI	47	1
Redwoods violet	WISE3	53	1
Deer fern	BLSP	40	3
Inside-out flower	VAHE	40	3

The herb layer is diverse, dominated by Oregon oxalis and sword fern. Vanilla leaf is always present. The very rich herb layer averages 73% cover. In addition to Oregon oxalis, small amounts of other moist site species such as false lily of the valley, Hooker’s fairybell, ladyfern, and/or deer fern are present. Moss cover averages 12%.

TSHE/OXOR-ACTR plots average 164 years old (range 53 to 250 years). Stands are moderately well stocked, with live basal area averaging 300 ft<sup>2</sup>/acre.

Plots average 26 vascular plant species, above the mean for the western hemlock series in the Coast Range.

Management Implications

These sites tend to be productive with fertile soils. Douglas-fir grows relatively well with an average site index of 155.

	<b>Site Index PSME</b>
<b>Mean</b>	155
<b>SE</b>	4
<b>Range</b>	110-212
<b>n</b>	66
<b>Age</b>	113
<b>n</b>	66

## Western hemlock/sword fern-NWO Coast

*Tsuga heterophylla/Polystichum munitum-NWO Coast*

TSHE/POMU-NWO Coast

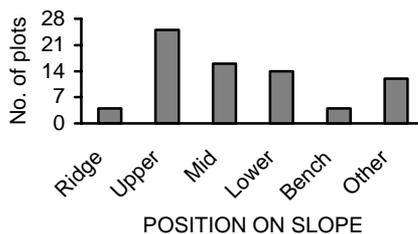
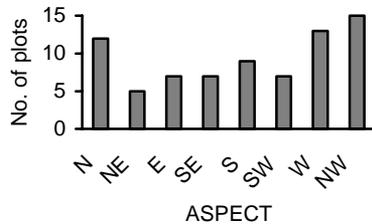
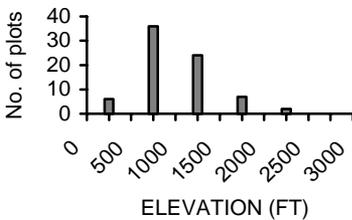
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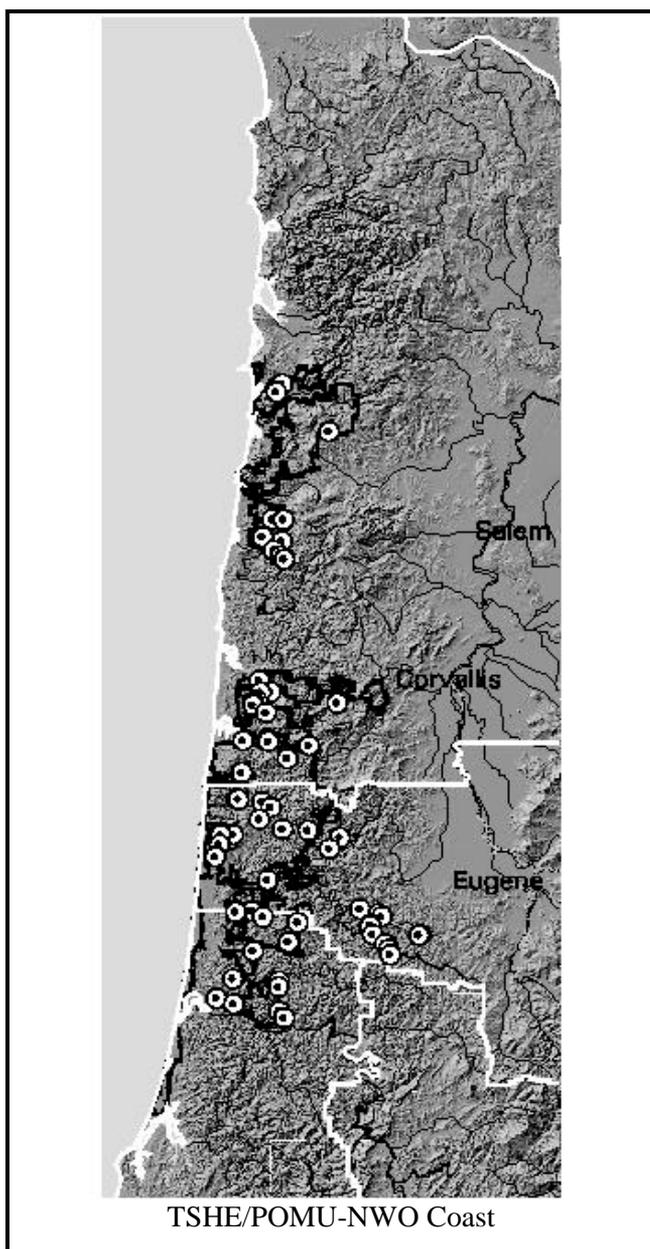
N=75 (SIU=60; EBLM=13; SBLM=2)

### Environment and Distribution

This plant association occurs on productive sites throughout the Coast Range, especially in the south. Plots are on flat to steep slopes averaging 48% (range 3-90%) from upper to lower-slope positions. Aspects vary, but cool northerly aspects are most common. Elevations average 1,011 feet (range 200-2,260 ft.).

Soils are well drained, but receive continuous subsurface moisture. Soils are usually deep and rich in organic matter.





## Vegetation Composition, Structure, and Diversity

The overstory in the TSHE/POMU-NWO Coast association is dominated by Douglas-fir and western hemlock, often with western redcedar and a minor component of red alder or bigleaf maple. Canopy closure of mature trees on sample plots averages 78%. Cover of understory trees averages 5%. This association has the sparsest shrub layer in the western hemlock series, with tall shrubs averaging 12% cover and low shrubs averaging 6% cover. Red huckleberry and salal are usually present, and sometimes salmonberry, all in small amounts. Herb cover averages 58% cover and is dominated by sword fern. Small amounts of miner's lettuce, Oregon oxalis and/or deer fern, typical of moist sites, are present. Moss cover averages 18%.

Sampled stands average 121 years old (53 to 250 years). Stands are relatively well stocked, with live basal area averaging 301ft<sup>2</sup>/acre.

Common name	Code	Constancy	Cover
<b>Overstory trees</b>			
Douglas-fir	PSME	95	44
Western hemlock	TSHE	79	42
Western redcedar	THPL	49	15
Red alder	ALRU2	36	15
Bigleaf maple	ACMA3	24	16
<b>Understory trees</b>			
Western hemlock	TSHE	73	11
Western redcedar	THPL	20	5
<b>Shrubs</b>			
Red huckleberry	VAPA	90	5
Salal	GASH	71	4
Salmonberry	RUSP	51	3
<b>Herbaceous</b>			
Sword fern	POMU	100	48
Miner's lettuce	CLSI2	77	2
Pacific trillium	TROV2	72	1
Redwoods violet	WISE3	62	2
Sweetscented bedstraw	GATR3	58	1
Oregon oxalis	OXOR	56	4
Deer fern	BLSP	47	3

Plots average 18 vascular plant species, which is below the mean for the western hemlock series in the Coast Range.

### Management Implications

These sites tend to be productive, with fertile soils. Douglas-fir grows well with an average site index of 168.

	Site Index PSME	Site Index TSHE
<b>Mean</b>	168	163
<b>SE</b>	2	5
<b>Range</b>	120-223	110-221
<b>Age</b>	132	93
<b>n</b>	97	32

Red alder regenerates and grows very well on most sites following disturbance. Where salmonberry cover is over 10%, competition can be substantial following canopy removal. Vigorous conifer seedlings can usually outgrow competing vegetation, except red alder, without release treatments. Sword fern sites are generally resilient to fire effects (Barnett 1984).

When sword fern associations occur near streams, they may be important sources of woody debris. Sword fern associations are visually pleasing, especially with stands of large trees. Late successional structural features develop rapidly in the sword fern type.

## Western hemlock/rhododendron-dwarf Oregon grape-NWO Coast

*Tsuga heterophylla/Rhododendron macrophyllum-Mahonia nervosa-NWO Coast*

TSHE/RHMA3-MANE2-NWO Coast

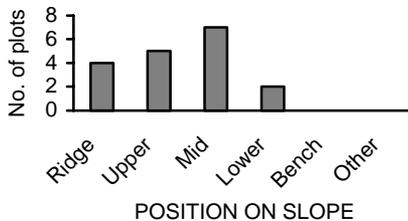
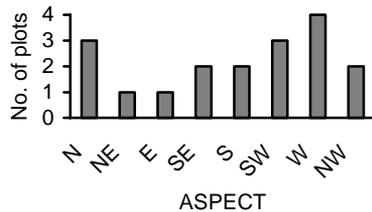
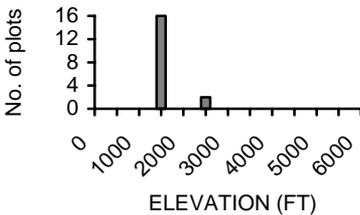
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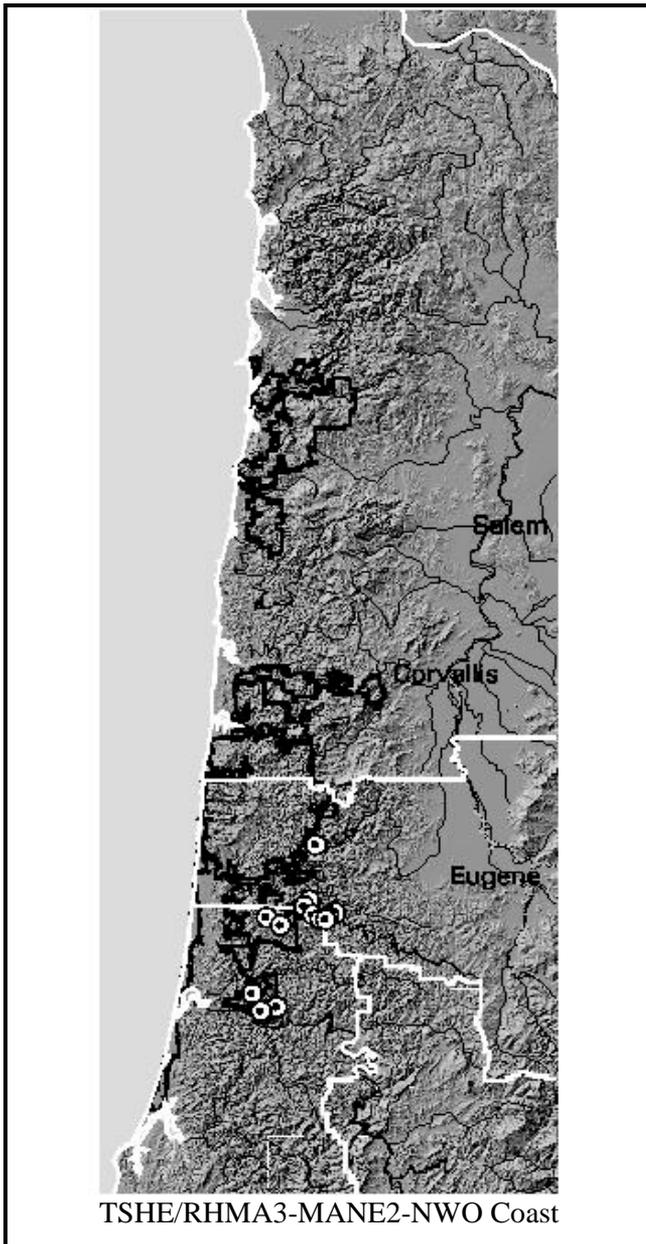
N=18 (SIU=9; EBLM=9)

### Environment and Distribution

This plant association occurs in the south central portion of the Coast Range on dry, often nitrogen poor sites. Plots are located on gentle to steep slopes averaging 54% (range 7-90%), primarily on mid-slope to ridge positions. Aspects vary, but northerly and westerly aspects are most common. Elevations average 1,561 feet (range 1,000-2,030 ft.).

Soils are shallow with a very low effective rooting depth. Soil nitrogen appears to be low enough on many sites to cause chlorosis. Lower soil nitrogen may be the result of frequent, hot, natural fires and a general absence of nitrogen fixing species during early succession.





## Vegetation Composition, Structure, and Diversity

The overstory in the TSHE/RHMA3-MANE2-NWO Coast association is dominated by Douglas-fir, often with a large component of western hemlock. Big-leaf maple is occasionally abundant. Canopy closure of mature trees averages 78%. Cover of understory trees averages 1%. This association has a well-developed shrub layer with tall shrubs averaging 57% cover and low shrubs averaging 15% cover. The shrub layer is dominated by rhododendron and dwarf Oregon grape, and often has significant amounts of vine maple. The shrub layer is indicative of warm, well-drained sites with nitrogen-poor soils. Herb cover is dominated by sword fern and averages 21% cover. Moss cover averages 14%.

Sampled stands in TSHE/RHMA3-MANE2-NWO Coast average 166 years old (range 85 to 250 years). Stands are well stocked, with live basal area averaging 307 ft<sup>2</sup>/acre.

Common name	Code	Constancy	Cover
<b>Overstory trees</b>			
Douglas-fir	PSME	100	59
Western hemlock	TSHE	50	45
Bigleaf maple	ACMA3	22	28
<b>Understory trees</b>			
Western hemlock	TSHE	33	2
Western redcedar	THPL	22	3
<b>Shrubs</b>			
Dwarf Oregon grape	MANE2	100	11
Rhododendron	RHMA3	100	48
Red huckleberry	VAPA	89	4
Salal	GASH	72	2
Vine maple	ACCI	67	30
<b>Herbaceous</b>			
Sword fern	POMU	94	20
Pacific trillium	TROV2	89	1
Oregon oxalis	OXOR	44	2

Plots average 15 vascular plant species, which is low for the western hemlock series in the Coast Range, and for other forested series in western Oregon.

### Management Implications

Douglas-fir has an average site index of 144. Summer moisture stress combined with poor soil nitrogen levels may be responsible for reduced growth. Red alder regenerates poorly. Management for red alder would be difficult.

	Site Index PSME	Site Index TSHE
Mean	144	151
SE	2	9
Range	105-190	124-171
Age	154	156
n	65	5

Early seral competition is moderate. Because Douglas-fir grows relatively slowly, salal, rhododendron, *Ceanothus sp.*, and big-leaf maple may gain a competitive advantage. Quickly established, vigorous seedlings should keep ahead of shrubs.

Most sites are sensitive to fire effects (Barnett 1984). Slash burning should be done over moist fuels on cool days, if at all. The risks of fire becoming intense enough to cause significant nitrogen loss are high.

Indirect watershed values may be high, since many TSHE/RHMA3-MANE2-NWO Coast communities occur on steep headwalls with thin soils.

## Western hemlock/rhododendron-salal-NWO Coast

*Tsuga heterophylla/Rhododendron macrophyllum-Gaultheria shallon-NWO Coast*

TSHE/RHMA3-GASH-NWOCOast

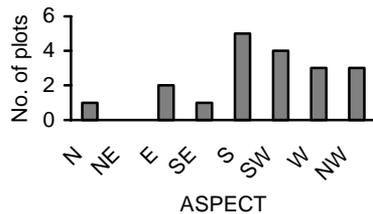
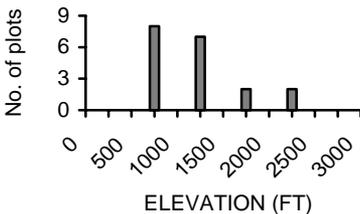
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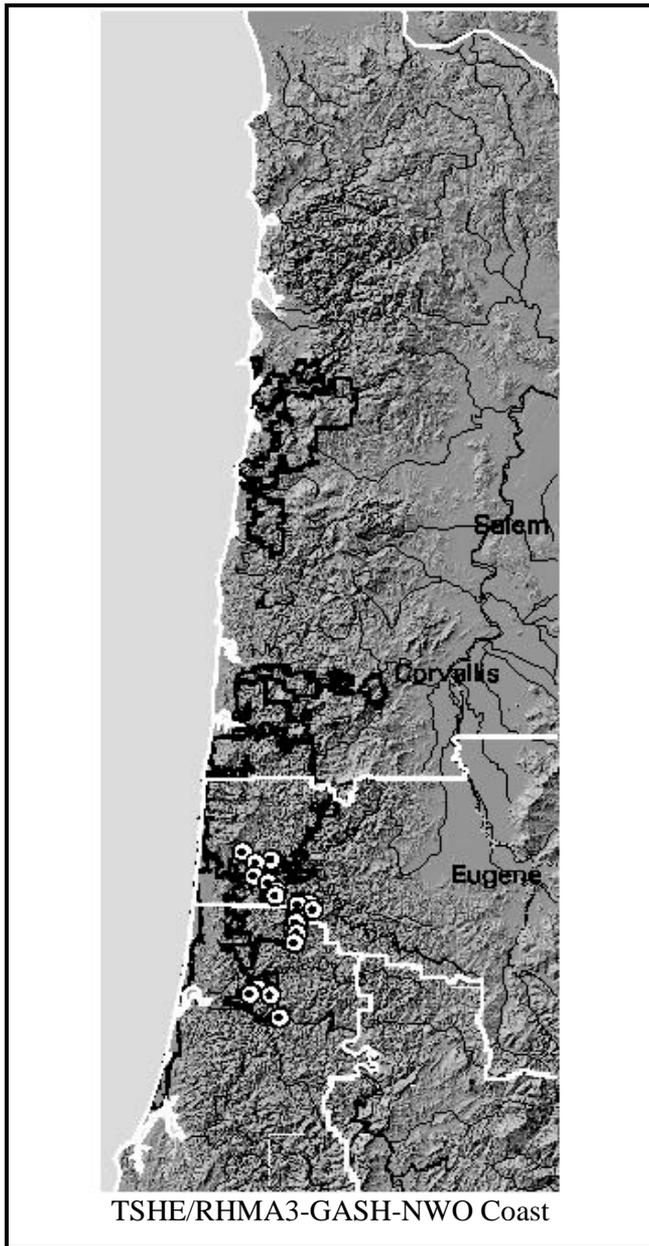
N=19 (SIU=19)

### Environment and Distribution

This plant association occurs in the south central Coast Range. Plots are located on flat to steep slopes averaging 53% (range 2-90%) on upper-slope positions. Warm southerly and westerly aspects are most common. Elevations average 1,142 feet (range 500-2,460 ft.).

Soils tend to be deeper than in other rhododendron associations, with average depth of 52 inches and average rooting depth of 38 inches. Most sites are topographically dry. Plots on northerly-facing slopes or with better soils have substantially higher Douglas-fir site indices. Nitrogen appears to be limiting on some sites and the canopy may be chlorotic.





## Vegetation Composition, Structure, and Diversity

The overstory in the TSHE/RHMA3-GASH-NWO Coast association is dominated by Douglas-fir, often with components of western hemlock and sometimes big-leaf maple and red alder. Canopy closure of mature trees averages 78%. Cover of understory trees averages 6%. This association has a well-developed shrub layer with tall shrubs averaging 64% cover and low shrubs averaging 19% cover. The shrub layer is dominated by rhododendron and salal, often with significant amounts of vine maple. The shrub layer is typical of warm dry sites. The presence of rhododendron and evergreen huckleberry indicate infertile, nitrogen-poor soils. Herb cover is relatively low and dominated by sword fern, averaging 25% cover. Moss cover averages 17%.

Common name	Code	Constancy	Cover
<b>Overstory trees</b>			
Douglas-fir	PSME	100	72
Western hemlock	TSHE	47	11
Big-leaf maple	ACMA3	37	10
Red alder	ALRU2	26	11
<b>Understory trees</b>			
Western hemlock	TSHE	32	5
Cascara buckthorn	RHPU	26	5
<b>Shrubs</b>			
Salal	GASH	100	24
Rhododendron	RHMA3	100	39
Red huckleberry	VAPA	84	7
Evergreen huckleberry	VAOV2	84	7
Vine maple	ACCI	68	26
Dwarf Oregon grape	MANE2	68	6
Trailing blackberry	RUUR	58	2
Oceanspray	HODI	42	8
<b>Herbaceous</b>			
Sword fern	POMU	100	22
Pacific trillium	TROV2	53	2
Bracken fern	PTAQ	47	2

TSHE/RHMA3-GASH-NWO Coast plots average 113 years old (75 to 250 years). Stands are moderately stocked, with live basal area averaging 265 ft<sup>2</sup>/acre.

Plots average 14 vascular plant species, low for the western hemlock series in the Coast Range, and for other forested series in western Oregon.

### Management Implications

Douglas-fir has an average site index of 164. On some sites *Ceanothus* sp. and big-leaf maple competition may be severe following harvest and burning. If planting is delayed or seedling establishment is slow, significant competition problems may develop.

	Site Index PSME
Mean	164
SE	4
Range	97-212
Age	117
n	52

As in all rhododendron types, moderate and hot slash fires can cause soil degradation and promote the establishment of *Ceanothus* sp. Chlorotic canopies in many stands probably reflect low nitrogen availability. Nitrogen fixers such as *Ceanothus* sp. should help recharge this soil nitrogen pool. Low soil nitrogen levels are often due to frequent, hot fires in the past. Most sites are moderately sensitive or sensitive to fire effects (Barnett 1984). TSHE/RHMA3-GASH-NWO Coast communities generally do not occur in riparian areas. Indirect effects on stream water quality may be significant when this association occurs on steep headwalls on south aspects.

**Western hemlock/rhododendron-evergreen huckleberry**  
*Tsuga heterophylla/Rhododendron macrophyllum-Vaccinium ovatum*

TSHE/RHMA3-VAOV2

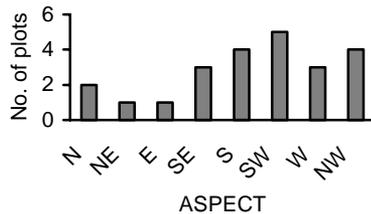
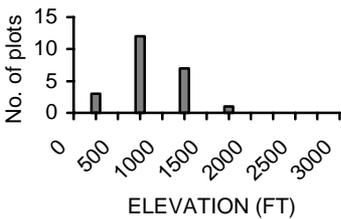
CHS324

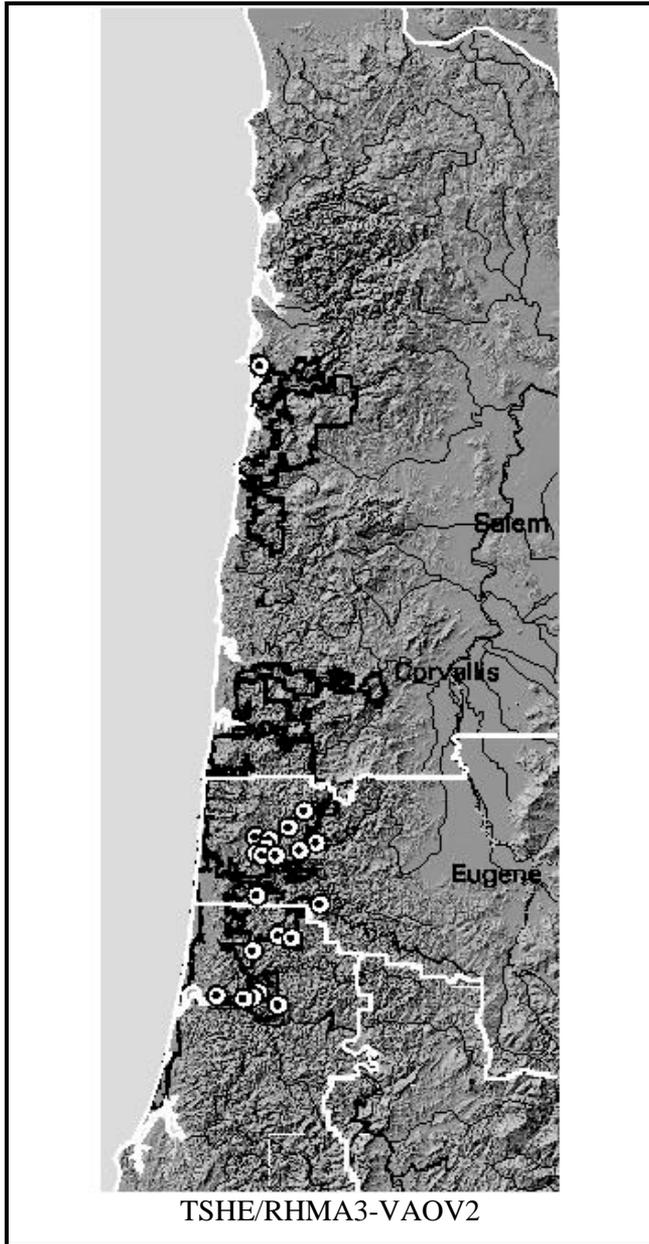
N=23 (SIU=22; EBLM=1)

Environment and Distribution

This plant association occurs primarily in the southern portion of the Coast Range, on dry sites with either steep, excessively drained soils or deep clay soils. Plots are located on flat to steep slopes averaging 51% (range 0-90%) on mid-slope to ridgetop positions. Aspects vary, but warm southerly or westerly aspects are most common. Elevations average 815 feet (range 120-1,280 ft.).

Soils average nearly 50 inches deep in sample plots, however, effective rooting depth is only 32 inches. Soils are dry, with summer drought developing early. Canopies and adjacent young stands are often thin and chlorotic, indicating nitrogen deficient soils.





## Vegetation Composition, Structure, and Diversity

The overstory in the TSHE/RHMA3-VAOV2 association is dominated by Douglas-fir, sometimes with components of western hemlock and/or big-leaf maple, and minor components of western redcedar and red alder. Canopy closure of mature trees averages 74%. Cover of understory trees averages 1%. This association has the densest shrub layer in the series, with tall shrubs averaging 78% cover and low shrubs averaging 20% cover. The shrub layer is dominated by rhododendron and evergreen huckleberry, often with significant amounts of vine maple and/or salal. The presence of rhododendron and evergreen huckleberry indicate infertile, nitrogen-poor soils. Herb cover is sparse, averaging 18% cover. The herb layer is dominated by sword fern. Moss cover averages 14%.

Common name	Code	Constancy	Cover
<b>Overstory trees</b>			
Douglas-fir	PSME	96	60
Western hemlock	TSHE	48	21
Big-leaf maple	ACMA3	39	12
Western redcedar	THPL	35	10
Red alder	ALRU2	26	9
<b>Understory trees</b>			
Cascara buckthorn	RHPU	39	5
Western hemlock	TSHE	39	1
<b>Shrubs</b>			
Rhododendron	RHMA3	100	35
Evergreen huckleberry	VAOV2	100	37
Red huckleberry	VAPA	83	4
Salal	GASH	78	17
Vine maple	ACCI	61	26
Trailing blackberry	RUUR	61	1
Dwarf Oregon grape	MANE2	52	3
<b>Herbaceous</b>			
Sword fern	POMU	91	15
Pacific trillium	TROV2	57	1

TSHE/RHMA3-VAOV2 stands average 126 years old (range 65 to 250 years). Stands are moderately stocked, with live basal area averaging 255 ft<sup>2</sup>/acre.

Plots average 16 vascular plant species, low for the western hemlock series in the Coast Range, and for other forested series in western Oregon.

Management Implications

Douglas-fir grows relatively well with an average site index of 155. Red alder regenerates and grows relatively poorly.

	Site Index PSME
Mean	155
SE	4
Range	80-208
Age	128
n	52

Most sites are moderately sensitive or sensitive to fire effects (Barnett 1984). As in the other rhododendron associations, moderate and hot slash fires can cause soil damage and nutrient loss. Fire will also stimulate germination of *Ceanothus* seed that may be stored in the soil. *Ceanothus* and big-leaf maple may pose competition problems on some sites; competition from *Ceanothus* species should be carefully weighed against the advantages of nitrogen fixation. In most cases, healthy conifer seedlings will survive and eventually over-top brush.

Indirect watershed values may be high, since many TSHE/RHMA3-VAOV2 communities occur on steep headwalls with thin soils.

## Western hemlock/rhododendron/sword fern

*Tsuga heterophylla/Rhododendron macrophyllum/Polystichum munitum*

TSHE/RHMA3/POMU

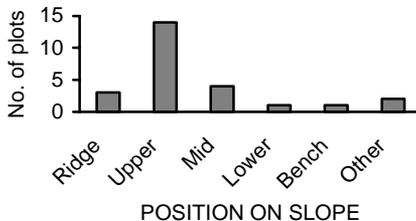
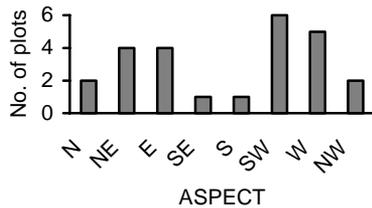
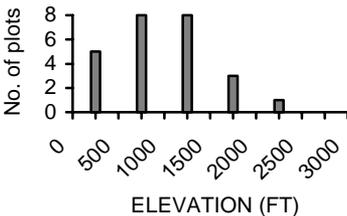
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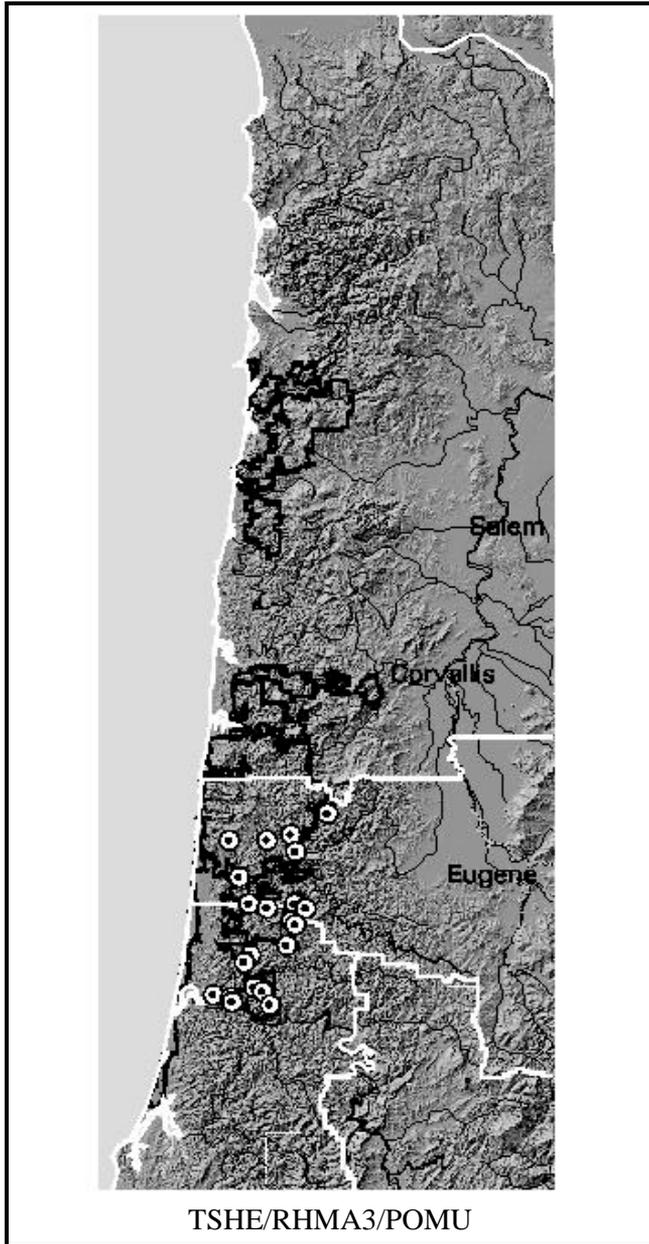
N=25 (SIU=25)

### Environment and Distribution

This plant association occurs in the southern portion of the Coast Range. It is the moistest of the rhododendron-dominated associations. Plots are located on flat to steep slopes averaging 59% (range 3-85%), primarily on upper-slope positions. Aspects vary, but easterly and westerly aspects are most common. Elevations are mostly below 1,800 feet, with elevation averaging 970 feet (range 100-2,300 ft.).

Soils average 40 inches deep with 22 inches effective rooting depth. Poor soils may be offset to some extent by sub-irrigation from upslope water sources. Soils tended to be either skeletal or clay-rich.





## Vegetation Composition, Structure, and Diversity

The overstory in the TSHE/RHMA3/POMU association is dominated by Douglas-fir, often with western hemlock. Big-leaf maple, western redcedar and/or red alder may also be present. Canopy closure of mature trees averages 75%. Cover of understory trees averages 1%. This association has a well-developed shrub layer with tall shrubs averaging 42% cover and low shrubs averaging 9% cover. The shrub layer is dominated by rhododendron, often with significant amounts of vine maple. Rhododendron cover is generally lower than in the other western hemlock/rhododendron associations. Herb cover is dominated by sword fern and averages 55% cover. Moss cover averages 12%.

Sampled stands in TSHE/RHMA3/POMU average 152 years old (range 84 to 250 years). Stands are well stocked, with live basal area averaging 282 ft<sup>2</sup>/acre.

Common name	Code	Constancy	Cover
<b>Overstory trees</b>			
Douglas-fir	PSME	100	58
Western hemlock	TSHE	64	25
Big-leaf maple	ACMA3	44	11
Western redcedar	THPL	40	13
Red alder	ALRU2	28	5
<b>Understory trees</b>			
Cascara buckthorn	RHPU	36	6
Western hemlock	TSHE	36	5
<b>Shrubs</b>			
Rhododendron	RHMA3	100	18
Red huckleberry	VAPA	88	6
Vine maple	ACCI	76	16
Dwarf Oregon grape	MANE2	72	2
Salal	GASH	56	4
Evergreen huckleberry	VAOV2	52	5
Salmonberry	RUSP	40	2
<b>Herbaceous</b>			
Sword fern	POMU	100	51
Pacific trillium	TROV2	64	2
Oregon oxalis	OXOR	60	5
Sweetscented bedstraw	GATR3	52	1

Plots average 16 vascular plant species, which is low for the western hemlock series in the Coast Range, and for other forested series in western Oregon.

### Management Implications

Douglas-fir grows relatively well with an average site index of 161. Site index increases as rhododendron cover drops and vine maple cover increases.

	Site Index PSME	Site Index TSHE
<b>Mean</b>	161	130
<b>SE</b>	3	4
<b>Range</b>	105-233	125-137
<b>Age</b>	128	98
<b>n</b>	82	3

Red alder regenerates and grows better than in other rhododendron types, but is not as productive as in TSHE/POMU-NWO Coast or TSHE/RUSP associations. Big-leaf maple and vine maple may resprout and grow quickly after disturbance. *Ceanothus* may occasionally be a strong competitor, particularly following slash burning.

The TSHE/RHMA3/POMU association often indicates thin, unstable soils. Soils in this type are not as susceptible to degradation and nutrient loss from moderate fires as those in other rhododendron associations.

The TSHE/RHMA3/POMU association merges with the TSHE/POMU-NWO Coast and TSHE/ACCI/POMU-NWO Coast associations as soil moisture increases. Low rhododendron cover and high vine maple and sword fern cover indicate moister soils and greater site productivity.

## Western hemlock/salmonberry

*Tsuga heterophylla/Rubus spectabilis*

TSHE/RUSP

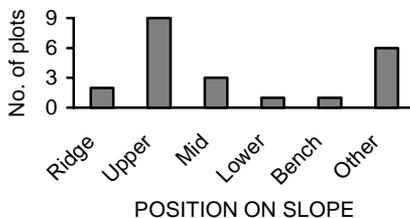
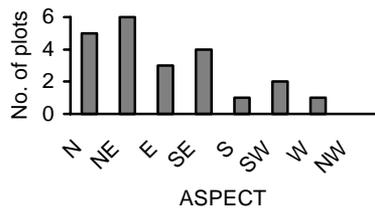
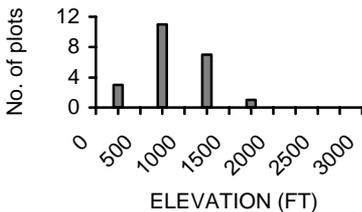
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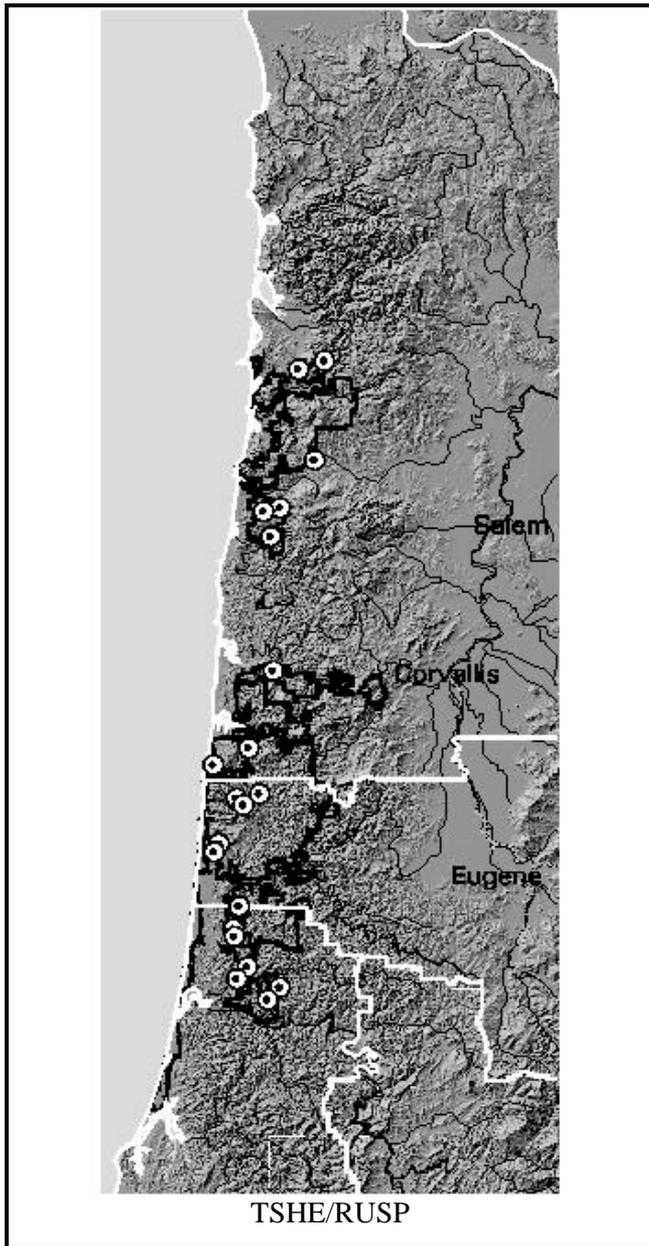
N=22 (SIU=22)

### Environment and Distribution

This plant association occurs on well-watered sites throughout western and central portions of the North Coast Range. On the east side of the Coast Range, where precipitation is low, salmonberry communities occur mainly in riparian areas. Plots are located on flat to steep slopes averaging 36% (range 0-80%) primarily on upper-slope positions or in draws. Plots occur on a variety of aspects, but mainly on northerly or easterly facing slopes. Elevations average 818 feet (range 140-1,620 ft.).

Soils are moist much of the year, but not as wet as in the devil's club association. Soil fertility is enhanced by the large inputs of nitrogen and organic matter during red alder dominated seral stages. In addition, intense burrowing by mountain beaver churns the soil, increasing aeration, and organic matter incorporation.





Soils in sample plots are moderately shallow, averaging 40 inches total depth and 34 inches effective rooting depth.

Vegetation Composition, Structure, and Diversity

The overstory in the TSHE/RUSP association is dominated by Douglas-fir, often with a significant component of western hemlock and/or red alder and a minor component of western redcedar. Sitka spruce may also be present in the transition between the spruce and western hemlock series. Younger stands may be nearly pure red alder with scattered, large Douglas-fir and western hemlock. Canopy closure of mature trees averages 72%. Cover of understory trees averages 3%.

Common name	Code	Constancy	Cover
<b>Overstory trees</b>			
Douglas-fir	PSME	96	44
Red alder	ALRU2	71	23
Western hemlock	TSHE	67	27
Western redcedar	THPL	42	14
Sitka spruce	PISI	25	1
<b>Understory trees</b>			
Western hemlock	TSHE	50	6
<b>Shrubs</b>			
Salmonberry	RUSP	100	51
Red huckleberry	VAPA	67	8
Fool's huckleberry	MEFE	54	5
Salal	GASH	42	2
<b>Herbaceous</b>			
Sword fern	POMU	100	44
Oregon oxalis	OXOR	79	14
Miner's lettuce	CLS12	75	3
Mexican hedgenettle	STME	67	3
Sweetscented bedstraw	GATR3	63	2
Deer fern	BLSP	55	2
Hooker fairybells	DIHO3	54	2
Pacific trillium	TROV2	50	1
Ladyfern	ATFI	50	3
False lily of the valley	MADI	50	3
<b>Grasses/Grasslikes</b>			
Field woodrush	LUCA2	58	1

This association has a well-developed shrub layer with tall shrubs averaging 62% cover and low shrubs averaging 8% cover. The shrub layer is dominated by salmonberry. Herb cover is dominated by sword fern, and averages 63% cover. Oregon oxalis may be abundant, and other forbs indicative of moist to wet sites are usually present in small amounts. Moss cover averages 27%.

TSHE/RUSP stands average 126 years old (range 70 to 250 years). Stands are moderately stocked, with live basal area averaging 254 ft<sup>2</sup>/acre. Basal area and stand volume are relatively low in the salmonberry association due to early seral competition.

Plots average 19 vascular plant species, which is relatively low for the western hemlock series in the Coast Range.

Management Implications

Douglas-fir grows very well with an average site index of 184, very high. High site index is due to favorable moisture conditions and good soil fertility. Salmonberry and alder compete vigorously after disturbance. Red alder often begins to grow rapidly by year 5, usually over-topping associated conifers.

Abundant green fuel on these sites can impede slash burning, which is often important in slowing salmonberry growth.

	Site Index PSME	Site Index TSHE
<b>Mean</b>	184	162
<b>SE</b>	3	3
<b>Range</b>	144-224	150-185
<b>Age</b>	113	104
<b>n</b>	50	12

The proximity to streams and ground water mean that erosion and vegetation management activities may impact water quality. According to the characteristics established by Barnett (1984), the TSHE/RUSP association is generally resilient to fire.

## Western hemlock/salmonberry-vine maple

*Tsuga heterophylla/Rubus spectabilis-Acer circinatum*

TSHE/RUSP-ACCI

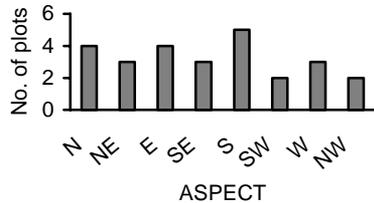
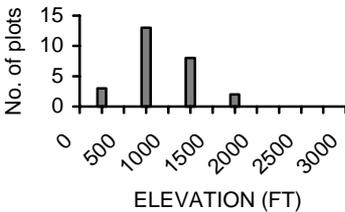
CHS422

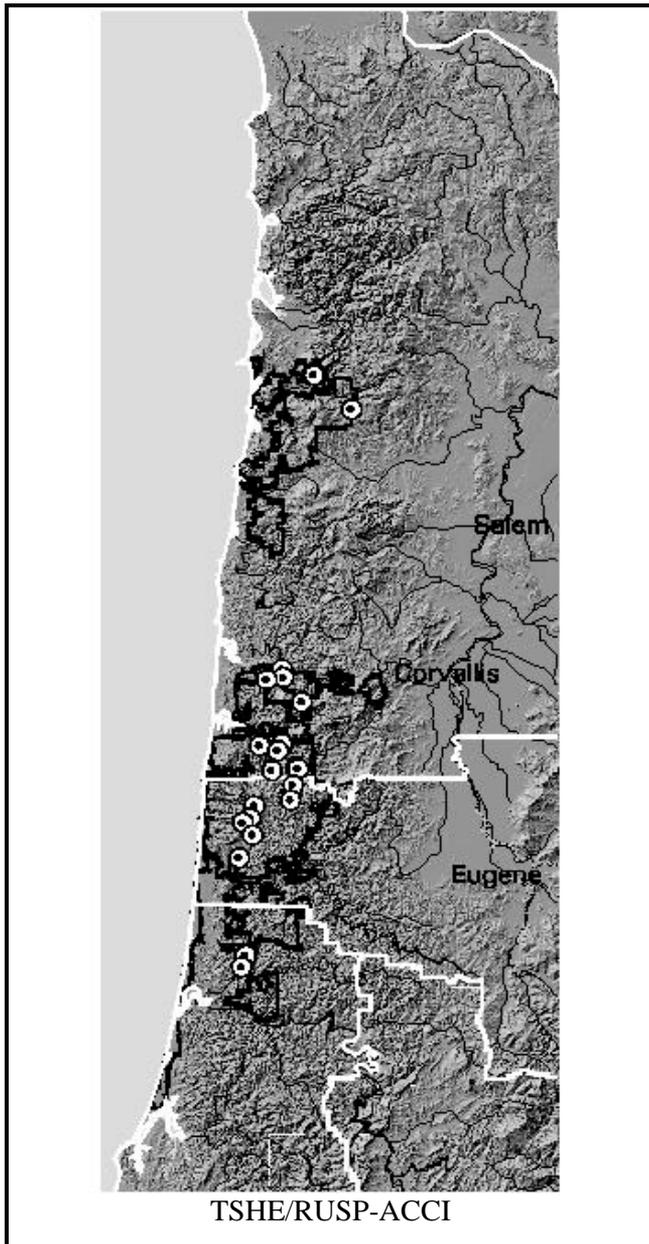
N=26 (SIU=26)

### Environment and Distribution

This plant association is found more inland and on warmer, slightly drier sites than the TSHE/RUSP association. Plots are located on gentle to steep slopes averaging 43% (range 5-90%) on side slopes, toeslopes, or in draws. Plots occurred on a variety of aspects. Elevations average 809 feet (range 100-1,510 ft.).

Soils are typically deep and rich in organic material. Soil depth of samples averages 51 inches, and effective rooting depth 32.5 inches. Soil moisture is abundant.





## Vegetation Composition, Structure, and Diversity

The overstory in the TSHE/RUSP-ACCI association is dominated by Douglas-fir, generally with a significant component of red alder and sometimes a minor component of western hemlock. Canopy closure of mature trees average 66%. Understory trees are very sparse or absent.

This association has a well-developed shrub layer with tall shrubs averaging 67% cover and low shrubs averaging 10% cover. The shrub layer is dominated by salmonberry and vine maple. Herb cover is dominated by sword fern and averages 60% cover. Other forbs indicative of moist to wet sites are usually present in small amounts. Moss cover averages 16%.

Common name	Code	Constancy	Cover
<b>Overstory trees</b>			
Douglas-fir	PSME	97	51
Red alder	ALRU2	70	32
Western hemlock	TSHE	33	14
<b>Understory trees</b>			
Cascara buckthorn	RHPU	40	2
<b>Shrubs</b>			
Vine maple	ACCI	100	46
Salmonberry	RUSP	100	30
Red huckleberry	VAPA	87	6
Salal	GASH	47	3
California hazel	COCO6	37	11
<b>Herbaceous</b>			
Sword fern	POMU	100	49
Miner's lettuce	CLSI2	90	2
Sweetscented bedstraw	GATR3	84	1
Oregon oxalis	OXOR	63	7
Deer fern	BLSP	60	1
Ladyfern	ATFI	47	2
Mexican hedgenettle	STME2	43	2
<b>Grasses/Grasslikes</b>			
Field woodrush	LUCA2	47	2

Sampled TSHE/RUSP-ACCI stands average 107 years old (range 60 to 227 years). Stands are moderately stocked, with live basal

area averaging 258 ft<sup>2</sup>/acre. Natural stand volume is relatively low in spite of rapid height growth. This may be due to relatively low stocking, which is a function of intense early seral competition with shrubs and alder.

Plots average 19 vascular plant species, relatively low for the western hemlock series in the Coast Range, and for other forested series in western Oregon.

### Management Implications

Douglas-fir grows very well with an average site index of 187. It is the most productive plant association in the western hemlock series in the Coast Range. Red alder also grows very well. High site index is due to favorable moisture conditions and fertile soil.

	Site Index PSME	Site Index TSHE
Mean	187	143
SE	3	12
Range	129-275	109-164
Age	112	100
n	58	4

Early succession usually involves rapid shrub response and intense competition among salmonberry, vine maple, red alder and conifers. Five years following disturbance, alder often begins to dominate the stand, suppressing both shrubs and conifers. Salmonberry-vine maple sites on lower slopes develop green biomass quickly and can be difficult to burn, but are generally resilient to fire (Barnett 1984).

The TSHE/RUSP-ACCI association is often adjacent to streams and makes important contributions to woody debris in streams, providing aquatic systems with nutrients and regulating sediment.

## Western hemlock/salmonberry-salal

*Tsuga heterophylla*/*Rubus spectabilis*-*Gaultheria shallon*

TSHE/RUSP-GASH

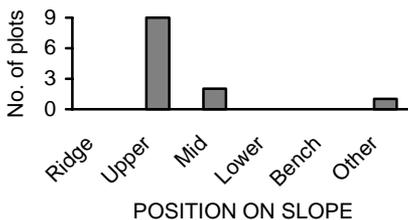
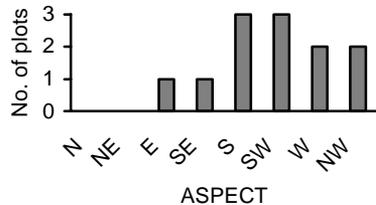
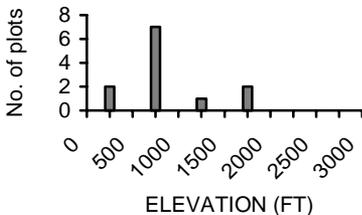
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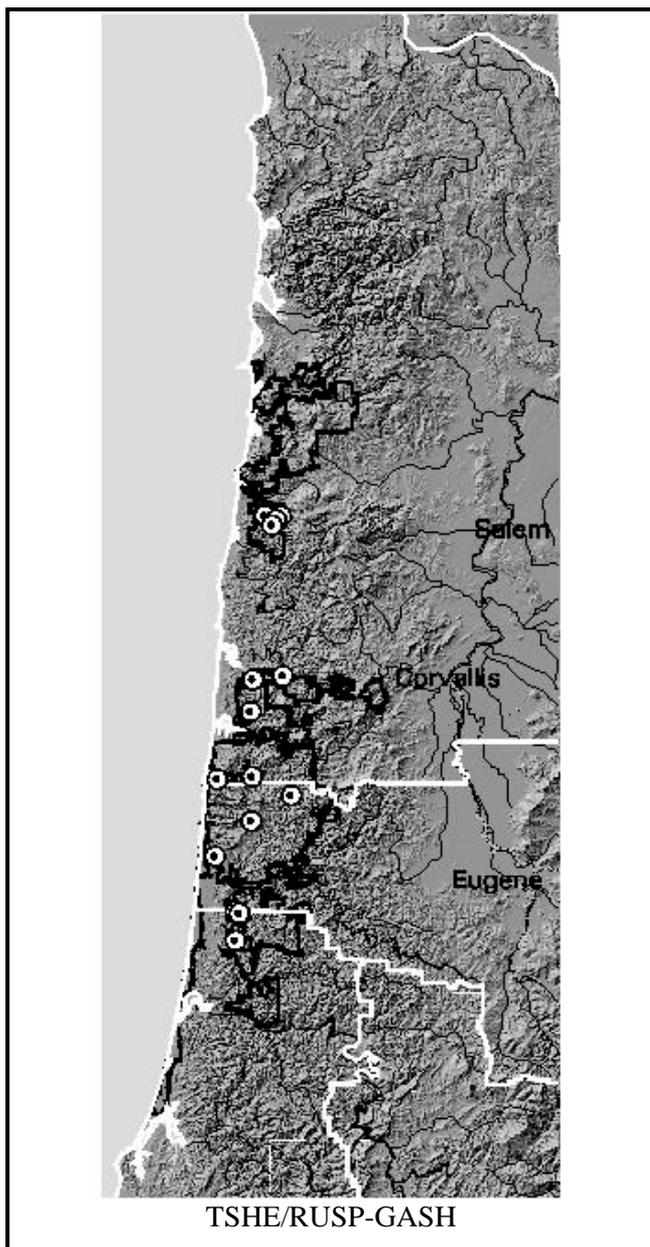
N=12 (SIU=12)

### Environment and Distribution

This plant association is most common in the west side of the central and southern portions of the North Coast Range. The environment is wet during winter, but not quite as dry as the TSHE/GASH-NWO Coast type in the summer. Plots are located on gentle to steep slopes averaging 53% (range 10-75%), primarily on upper-slope positions. Southerly and westerly aspects are most common. Elevations average 817 feet (range 300-1,650 ft.).

Soils average 46 inches deep with 37 inches effective rooting depth.





## Vegetation Composition, Structure, and Diversity

The overstory in the TSHE/RUSP-GASH association is dominated by Douglas-fir, often with a component of western hemlock and/or red alder. Canopy closure of mature trees averages 66%.

Understory trees are very sparse or absent. This association has a well-developed shrub layer, with tall shrubs averaging 63% cover and low shrubs averaging 17% cover. The shrub layer is dominated by salmonberry and salal. Red huckleberry is always present, and vine maple may be a significant component in some stands. Herb cover is dominated by sword fern and averages 34% cover. Moss cover averages 15%.

Common name	Code	Constancy	Cover
<b>Overstory trees</b>			
Douglas-fir	PSME	86	64
Red alder	ALRU2	71	13
Western hemlock	TSHE	57	19
Western redcedar	THPL	21	18
Sitka spruce	PISI	21	2
<b>Understory trees</b>			
Western hemlock	TSHE	36	1
Cascara	RHPU	29	5
<b>Shrubs</b>			
Salmonberry	RUSP	100	32
Salal	GASH	100	27
Red huckleberry	VAPA	100	12
Vine maple	ACCI	43	13
Dwarf Oregon grape	MANE2	36	4
Fool's huckleberry	MEFE	50	4
Thimbleberry	RUPA	50	4
<b>Herbaceous</b>			
Sword fern	POMU	100	31
Sweetscented bedstraw	GATR3	71	1
Miner's lettuce	CLSI2	71	1
<b>Grasses/Grasslikes</b>			
Field woodrush	LUCA2	43	1

TSHE/RUSP-GASH stands average 110 years old (range 58 to 194 years). Stands are moderately stocked, with live basal area averaging 258 ft<sup>2</sup>/acre. Natural stands may be sparsely stocked due to intense early seral shrub competition.

Plots average 17 vascular plant species, low for the western hemlock series in the Coast Range, and for other forested series in western Oregon.

Management Implications

Douglas-fir grows very well with an average site index of 176. Summer moisture stress and ridge-top exposure to wind keep conifer growth rates slightly below those found in the most productive associations.

	Site Index PSME
Mean	176
SE	4
Range	147-208
Age	113
n	20

Both salal and salmonberry respond vigorously to canopy removal. Salal does not compete intensely with conifers. Salmonberry probably does not respond to canopy removal as rapidly in this association as in the TSHE/RUSP association. Fire effects are generally moderate, according to the criteria established by Barnett (1984).

**Western hemlock/Alaska huckleberry/Oregon oxalis-NWO Coast**

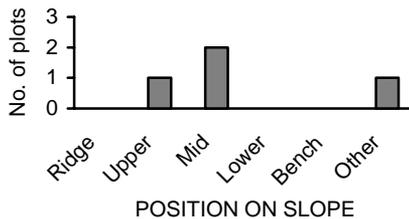
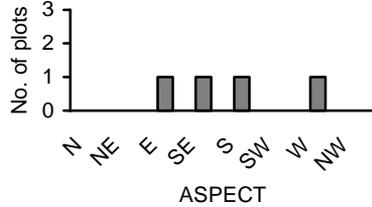
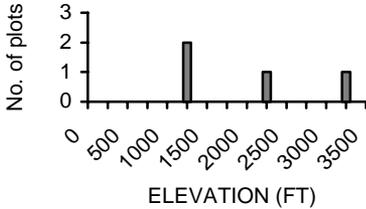
*Tsuga heterophylla/Vaccinium alaskaense/Oxalis oregana-NWO Coast*

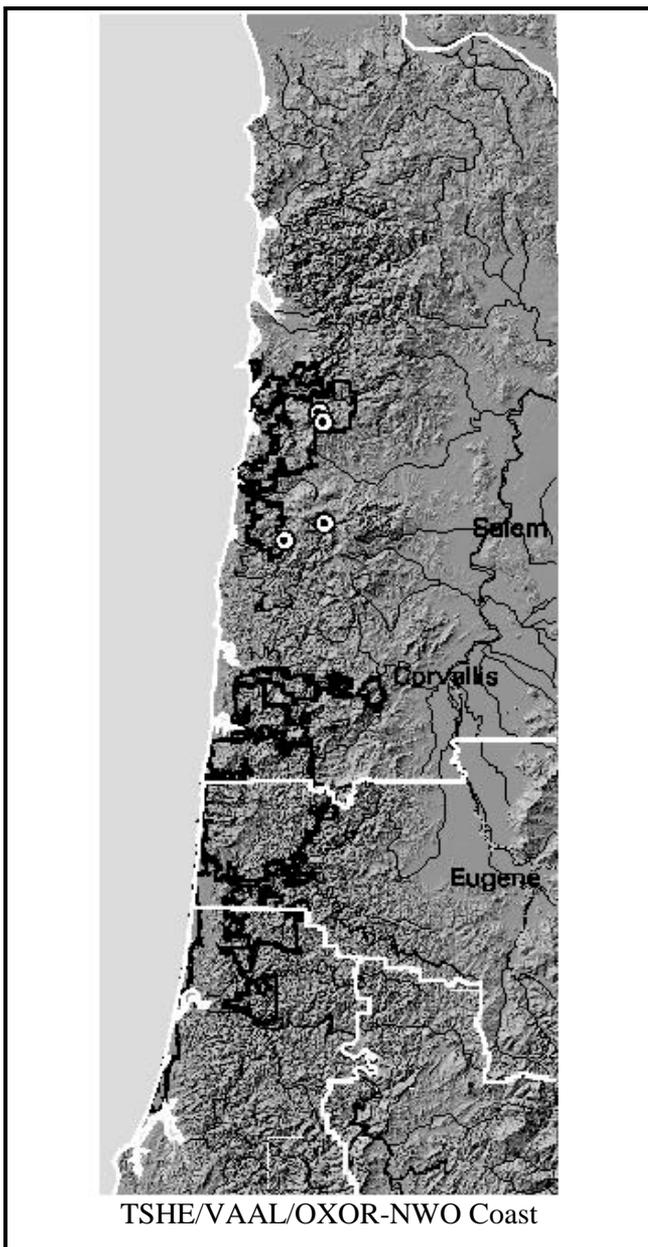
TSHE/VAAL/OXOR-NWO Coast  
CHS616

N=4 (SIU=3; SBLM=1)

Environment and Distribution

This uncommon plant association occurs in the northern portion of the Coast Range on relatively cool, moist sites with generally high precipitation. Plots are located primarily on gentle slopes, with 3 sample plots on 12 % slopes and 1 on 65% slope. The plots occurred on upper slope to toeslope positions. Aspects vary. These sites occur at relatively high elevations, with elevations averaging 1,933 feet (range 1,180-3,060 ft.).





## Vegetation Composition, Structure, and Diversity

The overstory in the TSHE/VAAL/OXOR-NWO Coast association is dominated by Douglas-fir, often with a major component of western hemlock. Canopy closure of mature trees averages 78%. Half the plots have a well-developed understory of regenerating trees. This association has a moderate shrub layer with tall shrubs averaging 37% cover and low shrubs averaging 2% cover. The shrub layer is dominated by Alaska huckleberry and red huckleberry.

Common name	Code	Constancy	Cover
<b>Overstory trees</b>			
Douglas-fir	PSME	100	54
Western hemlock	TSHE	50	50
<b>Understory trees</b>			
Western hemlock	TSHE	50	40
Cascara buckthorn	RHPU	25	1
Western redcedar	THPL	25	1
<b>Shrubs</b>			
Alaska huckleberry	VAAL	100	10
Red huckleberry	VAPA	100	21
Salal	GASH	75	1
Salmonberry	RUSP	75	5
Fool's huckleberry	MEFE	50	3
Red elderberry	SARA2	50	2
<b>Herbaceous</b>			
Oregon oxalis	OXOR	100	36
Sword fern	POMU	100	15
False lily of the valley	MADI	100	2
Pacific trillium	TROV2	100	1
Vanilla leaf	ACTR	75	1
Deer fern	BLSP	75	1
Queencup beadlily	CLUN2	75	2
Hooker fairybells	DIHO3	75	2
Starry false solomon's seal	MAST4	75	4
Scouler's harebell	CASC7	50	1
Miner's lettuce	CLSI2	50	1
Bracken fern	PTAQ	50	2
Coolwort foamflower	TITR	50	2
Redwoods violet	WISE3	50	4
<b>Grasses/Grasslikes</b>			
Columbia brome	BRVU	50	3

The lush herb layer is dominated by Oregon oxalis and sword fern, averaging 61% cover. A diverse mix of moist site forbs also occurs in smaller amounts. Moss cover averages 23%.

TSHE/VAAL/OXOR-NWO Coast stands average 107 years old (range 43 to 234 years). Stands are well stocked, with live basal area averaging 330 ft<sup>2</sup>/acre. Plots average 23 vascular plant species, near the mean for the western hemlock series in the Coast Range.

### Management Implications

Douglas-fir grows relatively well with an average site index of 160.

	<b>Site Index PSME</b>
<b>Mean</b>	162
<b>SE</b>	4
<b>Range</b>	132-187
<b>Age</b>	127
<b>n</b>	14

## Western hemlock/evergreen huckleberry

*Tsuga heterophylla/Vaccinium ovatum*

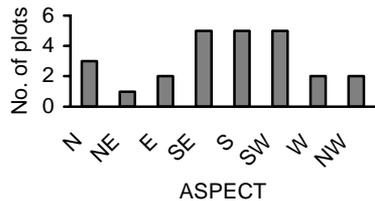
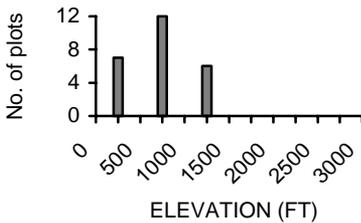
TSHE/VAOV2

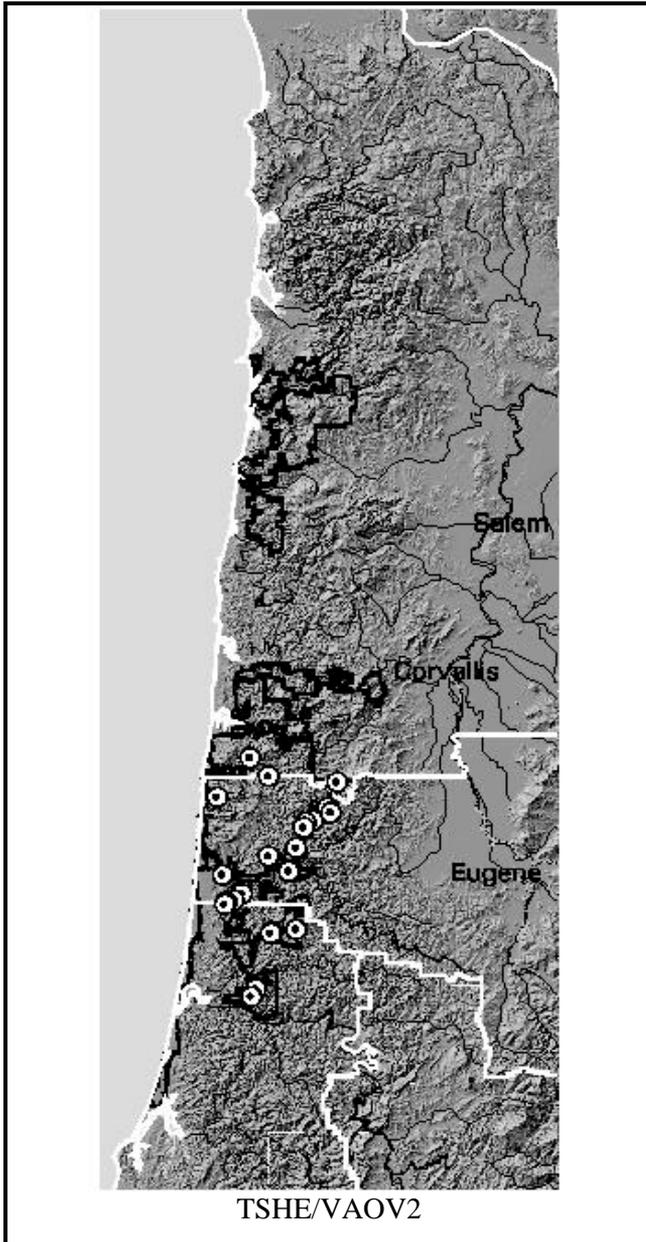
CHS610

N=25 (SIU=24; SBLM=1)

### Environment and Distribution

This plant association occurs primarily in the southern part of the North Coast Range. Plots are located on gentle to steep slopes averaging 48% (range 5-85), often on upper-slope positions. Aspects vary, but south-facing slopes are most common. Elevations average 718 feet (range 320-1,220 ft.).





Soils are well drained; soil moisture is less abundant than in the TSHE/POMU-NWO Coast association but more abundant than in the rhododendron associations. Soil depth averages 48 inches with 36 inches of effective rooting depth.

Vegetation Composition, Structure, and Diversity

The overstory in the TSHE/VAOV2 association is dominated by Douglas-fir, often with western hemlock and/or western redcedar, and a minor component of bigleaf maple and /or red alder. Canopy closure of mature trees averages 77%. The understory layer is sparse, averaging 3% cover.

Common name	Code	Constancy	Cover
<b>Overstory trees</b>			
Douglas-fir	PSME	100	57
Western hemlock	TSHE	68	16
Western redcedar	THPL	56	29
Bigleaf maple	ACMA3	24	28
Red alder	ALRU2	24	9
<b>Understory trees</b>			
Cascara buckthorn	RHPU	28	3
Western hemlock	TSHE	24	3
Western redcedar	THPL	20	7
<b>Shrubs</b>			
Evergreen huckleberry	VAOV2	100	22
Salal	GASH	88	9
Red huckleberry	VAPA	80	7
Vine maple	ACCI	72	41
Dwarf Oregon grape	MANE2	48	5
Trailing blackberry	RUUR	44	1
Salmonberry	RUSP	40	4
<b>Herbaceous</b>			
Sword fern	POMU	100	40
Pacific trillium	TROV2	80	1
Sweetscented bedstraw	GATR3	60	1
Oregon oxalis	OXOR	48	8

This association has a well-developed shrub layer with tall shrubs averaging 55% cover and low shrubs averaging 17% cover. The shrub layer is dominated by evergreen huckleberry, and often with vine maple. Composition of the shrub layer is typical of warm sites with well-drained soils. The herb layer is dominated by sword fern and averages 44% cover. Moss cover averages 12%.

TSHE/VAOV2 stands average 121 years old (range 75 to 175 years). Stands are well stocked, with live basal area averaging 321 ft<sup>2</sup>/acre.

Plots average 16 vascular plant species, low for the western hemlock series in the Coast Range, and other forested series in western Oregon.

Management Implications

Douglas-fir grows relatively well with an average site index of 168. Natural red alder regeneration is generally poor and growth is relatively slow.

	Site Index PSME	Site Index TSHE
<b>Mean</b>	168	172
<b>SE</b>	4	6
<b>Range</b>	88-225	143-198
<b>Age</b>	117	79
<b>n</b>	67	9

Shrub competition after canopy removal is slight. Moderate and hot slash fires should be avoided since many sites are on upper slopes with relatively poor soils, possibly with low nitrogen levels. Most sites are moderately sensitive to fire effects (Barnett 1984).